

## PERMANENT MAGNET FIELD SMALL DC MOTOR

### TECHNICAL FIELD

The present invention relates to a permanent magnet field small DC motor having a thin arc-shaped rare-earth magnet of a maximum thickness of 1 mm or less. The motor operating on a low starting voltage and a low starting current yet yielding a high output with an accurate revolving performance at a lower cogging torque. A typical field of application of these motors is in an optical pickup for a MD, CD-ROM and the like audio-visual equipment.

### BACKGROUND ART

FIG. 1(a) is a cross sectional view at a key portion of a permanent magnet field small DC motor relating to the present invention; FIG. 1(b) shows an arc-shaped magnet used in the motor. In the drawings, a pair of arc-shaped magnets 1, a soft-magnetic frame 2, an armature 3, which includes a brush-rectifier, a rotating shaft and a bearing, and a U-shaped spring 4 for pressing and securing the pair of arc-shaped magnets 1 in the soft-magnetic frame 2 are shown. The permanent magnet field small DC motor under discussion is requested to be further miniaturized, yet to provide a higher output and an accurate revolving performance, like in other permanent magnet motors.

As a general rule among the permanent magnet field small DC motors, it is difficult to maintain the output with a diameter of the armature 3 reduced. Especially in a motor using a ferrite magnet, whose maximum energy product  $[BH]_{\max}$  is low irrespective of whether it is fabricated by sintering, or by compression molding, injection molding or extrusion molding of a material mixed with a resin binder, the air-gap between the arc-shaped magnet 1 and an armature 3 is not provided with a sufficiently strong static magnetic field when miniaturized. Hence, the output is significantly reduced. In an attempt to provide the air-gap between the arc-shaped magnet 1 and the armature 3 with strong static magnetic

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